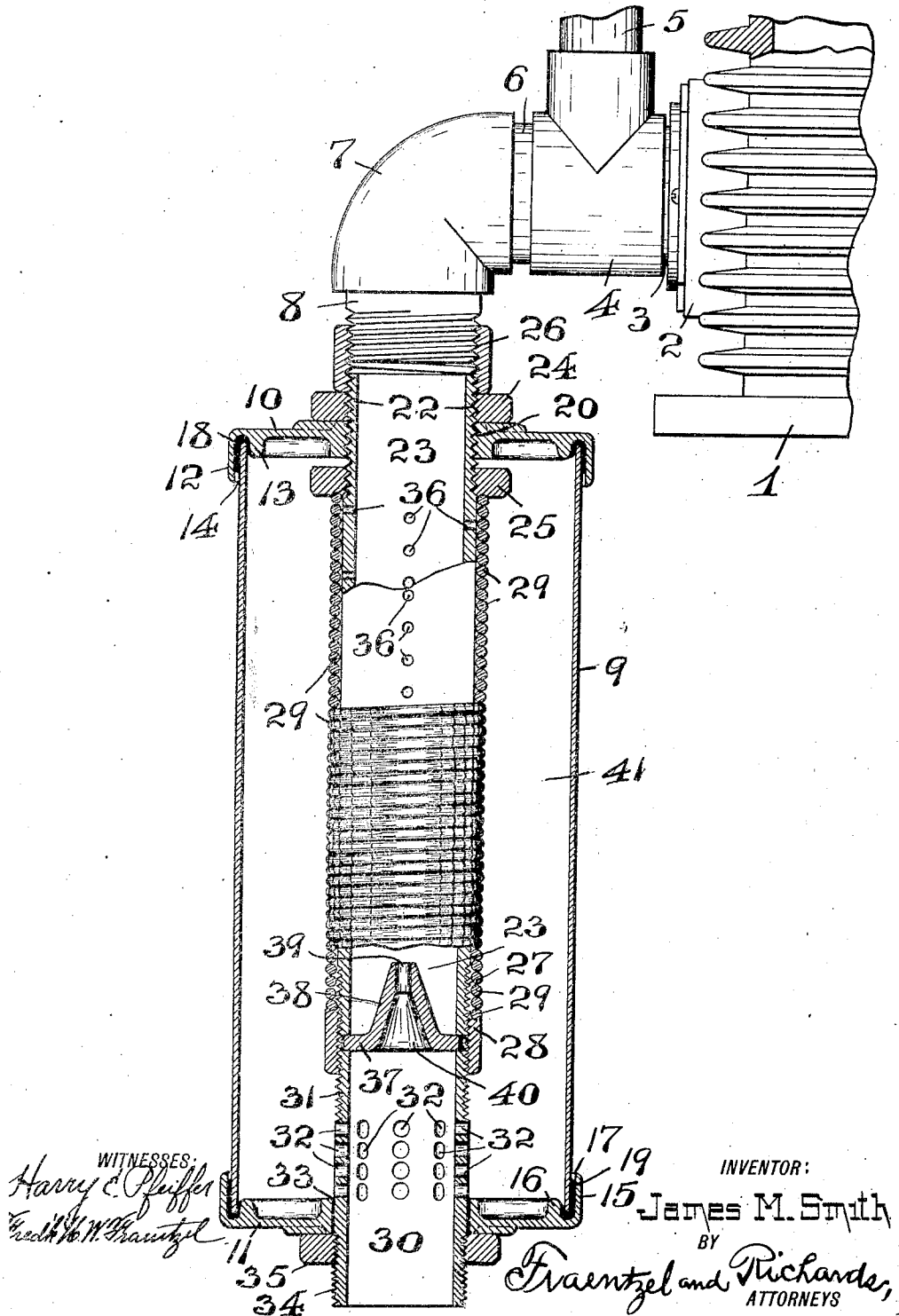


J. M. SMITH.
MUFFLER FOR ENGINES.
APPLICATION FILED DEC. 9, 1911.

1,053,661.

Patented Feb. 18, 1913.



UNITED STATES PATENT OFFICE.

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MUFFLER FOR ENGINES.

1,053,661.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JAMES M. SMITH, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Mufflers for Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

This invention has reference, generally, to improvements in mufflers for engines; and, the invention, relates more particularly, to a novel device of the general character hereinafter set forth, which is to be employed in connection with explosive gas or other engines for the purposes of deadening or muffling the sound made by the exhaust from the engine-cylinder, the device being constructed in the form of an exhaustor which acts to more readily withdraw the exhaust gas from the engine-cylinder and dispel the same into the air without noise.

The present invention has for its principal object to provide a novel and simply constructed, as well as an effectively operating, muffling device for engines, which is especially adapted for use in connection with explosive gas-engines, and is more particularly for the purpose of allowing the exploded or exhaust gas as it exhausts or escapes from the cylinder of the engine to expand noiselessly into a relief-chamber, from which, owing to the construction of the muffling device, the expanded gas, within said relief-chamber is withdrawn by suction, in the manner of an ejector and by the primary action of a portion of the exploded gas from the cylinder of the engine, and expelled noiselessly from an eduction member into the air.

Other objects of this invention not at this time more particularly enumerated will be clearly understood from the detailed description of the present invention.

With the various objects of the present invention in view, the invention consists, primarily, in the novel muffler of the general character hereinafter set forth; and, the invention consists, furthermore, in the various

arrangements and combinations of the several devices and parts, as well as in the details of the construction of the said parts, all of which will be more fully described in the following specification, and then finally embodied in the clauses of the claim which are appended to and which form an essential part of the said specification.

The invention is fully illustrated in the accompanying drawing, which illustrates a muffler showing one embodiment of the principles of the present invention, the muffler being represented in transverse vertical section, with a certain portion thereof in elevation, said view illustrating also, in elevation, a means of connection of the muffler with the exhaust-duct or ducts of an engine-cylinder, a portion of the cylinder being also represented in said drawing.

Referring now to the said drawing, the reference-character 1 indicates any desired construction of cylinder of an explosive-gas engine, said cylinder being provided with a suitable exhaust-chamber, as 2, with which is connected an exhaust-pipe 3, and in which is arranged by means of a T-fitting, as 4, or in any other suitable manner, a second exhaust-pipe 5 leading from the usual exhaust chamber in the upper portion of the engine-cylinder, but not here shown. Connected with the said fitting 4 is a pipe 6, an elbow 7, and pipe 8, from the screw-threaded portion of which the muffling device embodying the principles of the present invention is suitably suspended.

The muffling device consists, essentially, of a suitable cylindrical shell, as 9, provided at the top with a head 10 and at the bottom with a head 11, the head 10 being formed with an annular flange 12 and annular rib 13, forming an annular groove or depression 14, and the said head 11 being similarly formed with an annular flange 15 and annular rib 16, forming an annular groove or depression 17. Packing rings, as 18 and 19, are arranged in the respective grooves or depressions 14 and 17, so as to produce tight joints between the heads and the respective ends of the cylinder or shell 9, as will be clearly understood from an inspection of the drawing.

The upper cylinder-head 10 is formed with a screw-threaded opening 20 into which is screwed the upper screw-threaded end-portion 22 of a gas-receiving pipe or

duct 23, suitable lock-nuts 24 and 25 being screwed upon said screw-threaded end-portion and arranged upon the opposite side of said cylinder head 10 for securely and rigidly securing the said pipe or duct 23 to the said cylinder head 10 and within the cylinder 9, as will be clearly evident. The extreme upper end-portion of the said duct or pipe 23 extends beyond the said lock-nut 24, and is connected with the screw-threaded portion of the pipe 8 by means of an internally screw-threaded sleeve or union 26, so as to establish a direct passage from the exhaust-chamber 2 of the engine-cylinder into the said pipe or duct 23. The lower end-portion of the said pipe 23 is also externally screw-threaded, as at 27, and is provided with an internally screw-threaded ring or union 28 which is screwed upon said screw-threaded end-portion 27. The said pipe or duct 23 is encircled upon its cylindrical surface between the said lock-nut 25 and the said ring or union 28 by means of a suitably coiled relief-spring 29, the purpose of which will be presently more fully set forth. Screwed into the internally screw-threaded portion of the ring 28 is the upper screw-threaded portion 31 of an eduction pipe or piece of tubing 30, the said pipe or tubing 30 being provided with a series of suitably placed holes or openings 32 within the relief-chamber formed by the cylinder 9, and the said pipe or tubing 30 extending through a suitable hole or opening 33 in the lower cylinder-head 11. The lower end-portion of the said pipe or tubing 30 is also externally screw-threaded, as at 34, and upon the said screw-threaded portion 34 is a suitable lock-nut 35. The cylindrical wall of the pipe or duct 23 is provided with any desirable number of suitably disposed holes or perforations 36, which radiate toward or from the longitudinal central axis of the said pipe 23, the centers of the said holes or perforations being preferably arranged in such a manner so that they are upon an imaginary line, forming a helix around the outer cylindrical surface of the said pipe 23. Within the lower end-portion of the said pipe or tube 23, and suitably held in position by means of the assembled pipes 23 and 30 and the connecting link 28, substantially in the manner shown in the drawing, is a gas-expanding member or element 37, said member or element 37 being formed with a cone-shaped portion 38 which is formed with a narrow inlet 39 and an outlet 40 extending from the said inlet-portion, and said outlet being much wider at its discharge-end, than at the point where it is connected with the said inlet-portion. When the several coils of the relief-spring 29 have been suitably compressed, so as to lie in close contact as illustrated, the coils of the said spring will close the previously mentioned holes or perforations 36 in the pipe 23, the spring-coils having such resiliency so as to produce a retarding effect from the escaping or exhausted gas, steam, or the like, during the escape of the same through the said holes or perforations 36 from within the pipe 23 into the relief-chamber 41 formed by the cylinder 9 and its heads 10 and 11, and the passage of the compressed and exhausted gas or steam will be noiselessly effected. Within the said relief-chamber 41 the said gas or steam is permitted to expand and thereby lose its expansive power, as will be clearly evident. It will be seen from an inspection of the drawing, that some of the exhausted gas or steam when received within the interior of the pipe 23 will also pass into the inlet-portion 39 of the gas-expanding member or element 37, the exhausted gas or steam passing from said inlet-member 39, in the form of a jet, into the outlet portion 40 and into the eduction tube or pipe 30. This portion of the gas or steam as it leaves the inlet-portion 39 of the said element or member 37 suddenly expands to its full extent, and in passing downwardly through the said pipe or duct 30 and pass the holes or perforations 32, creates a vacuum and a sufficient suction for the withdrawal of the fully expanded and dead gas or steam within the relief-chamber 41 from the said chamber through the said perforations or holes 32 and into the eduction pipe or tube 30 from which the said gas or steam noiselessly passes into the air.

From the above description of the present invention, it will be clearly seen that I have devised a simply constructed and effectively operating muffler, which is especially adapted for use with explosive gas-engines, but which may also be used in connection with steam and other engines; and, in fact, with mechanisms of the various kinds from which compressed gas or steam or other suitable medium is exhausted, to deaden and entirely overcome the noise made by such exhausting medium.

I am fully aware that the present invention is capable of changes in the various arrangements and combinations of the several devices and parts, as well as in the details of the construction of the same, without departing from the scope of the said invention as hereinbefore set forth, and as defined in the claims which are appended thereto. Hence, I do not limit my invention to the exact arrangements and combinations of the several devices and parts as described in the said specification; nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

I claim:—

1. In a muffler for engines, a chambered member providing a relief-chamber, a tubu-

lar element connected with and extending into said relief-chamber adapted to receive the exhausted medium, said tubular element being provided with radially extending and helically disposed perforations for conveying the exhausted medium into said relief-chamber, a coiled relief-spring encircling the outer surface of said tubular element, the central helical pitch-line of the coils of said spring corresponding to an imaginary helical line around said tubular element on which said holes or perforations have their centers, and a gas-expanding element connected with said tubular element into and through which a portion of the exhausted medium is passed, said gas-expanding element having a contracted inlet-portion and a flaring outlet-portion into and through which a portion of the exhausted medium is passed to extract the exhausted medium by suction from said relief-chamber.

2. In a muffler for engines, a chambered member providing a relief-chamber, a tubular element connected with and extending into said relief-chamber adapted to receive the exhausted medium, said tubular element being provided with radially extending and helically disposed perforations for conveying the exhausted medium into said relief-chamber, a coiled relief-spring encircling the outer surface of said tubular element, the central helical pitch-line of the coils of said spring corresponding to an imaginary helical line around said tubular element on which said holes or perforations have their centers, and a gas-expanded element connected with said tubular element into and through which a portion of the exhausted medium is passed, said gas-expanding element having a contracted inlet-portion and a flaring outlet-portion into and through which a portion of the exhausted medium is passed, and an ejector-pipe connected with said gas-expanding element, said pipe being formed in its sides with perforations through which the exhausted medium is extracted by suction from said relief-chamber.

3. A muffler for engines comprising a cylinder, and cylinder-heads at the respective ends thereof, said cylinder-heads being provided with centrally disposed openings, the opening in the upper cylinder-head being internally screw-threaded, a tube-like element within said cylinder, said tube-like element being externally screw-threaded in its upper end-portion, said screw-threaded portion being screwed into the internally screw-threaded opening of said upper cylinder-head, said tubular element being also externally screw-threaded upon its lower end-portion, and said tubular element being pro-

vided with perforations for conveying the exhausted medium from said tubular element into the relief-chamber formed by the said cylinder, a coiled relief-spring encircling said tubular element, an internally screw-threaded ring screwed upon the lower screw-threaded end-portion of said tubular element, an eduction-pipe arranged in the opening of said lower cylinder-head, said eduction pipe having a screw-threaded portion screwed into the said internally screw-threaded ring, and the said eduction pipe being provided with a series of perforations, and means between said tubular element and said eduction pipe for exhausting the exhausted medium by suction from the relief-chamber into said eduction-pipe, substantially as and for the purposes set forth.

4. A muffler for engines comprising a cylinder, and cylinder-heads at the respective ends thereof, said cylinder-heads being provided with centrally disposed openings, the opening in the upper cylinder-head being internally screw-threaded, a tube-like element within said cylinder, said tube-like element being externally screw-threaded in its upper end-portion, said screw-threaded portion being screwed into the internally screw-threaded opening of said upper cylinder-head, said tubular-element being also externally screw-threaded upon its lower end-portion, and said tubular element being provided with perforations for conveying the exhausted medium from said tubular element into the relief chamber formed by the said cylinder, a coiled relief-spring encircling said tubular element, an internally screw-threaded ring screwed upon the lower screw-threaded end-portion of said tubular element, an eduction-pipe arranged in the opening of said lower cylinder-head, said eduction pipe having a screw-threaded portion screwed into the said internally screw-threaded ring, and the said eduction pipe being provided with a series of perforations, and a gas-expanding element between the said tubular element and eduction pipe, said gas-expanding element being provided with a contracted inlet-opening and a flaring outlet-opening into and through which a portion of the exhausted medium passes and is expanded and by suction exhausts the exhausted medium from the relief-chamber into said eduction pipe.

In testimony, that I claim the invention set forth above I have hereunto set my hand this 5th day of December, 1911.

JAMES M. SMITH.

Witnesses:

GEORGE D. RICHARDS,
CHARLES A. MACRUDER.